Dissipation of internal waves generated by geostrophic motions over small scale topography

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Deep reaching geostrophic flows in the Southern Ocean are suspected to energize internal lee waves close to bottom topography. Recent studies suggest that these internal lee waves generated in the Southern Ocean could largely be dissipated close to bottom topography. Nikurashin and Ferrari (2010b) proposed from two-dimensionnal numerical simulations that such bottom intensification may result from coupling between these waves and inertial oscillations. We have studied the spatial distribution of turbulent kinetic energy dissipation resulting from this coupling. For this purpose, we performed a series of two-dimensionnal non-hydrostatic numerical simulations of a geostrophic flow over an idealized topography for a range of physical and numerical parameters. We have shown that, in this particular flow configuration, the vertical distribution of turbulent kinetic energy dissipation is set by the vertical structure of inertial oscillations generated during internal lee wave breaking. We also extended the theory of Nikurashin and Ferrari (2010b) in order to predict the vertical structure of these inertial oscillations from large scale parameters (Labreuche et al. 2013, submitted). The presentation will focus on the critical height below which most of the dissipation occurs, as well as the amount of dissipation taking place.

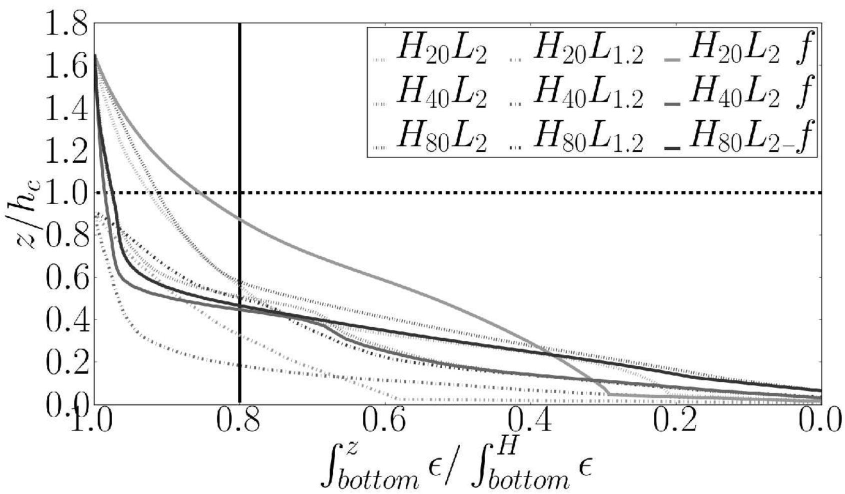

Figure 1: Fraction of the dissipated energy that is dissipated under a given height. The height z is normalized by the theoretical height of bottom dissipation hc , and a horizontal black line is drawn at z = hc .

1. Labreuche P., Le Sommer J. and Staquet C., Dissipation of internal waves generated by geostrophic motions over small scale topography. Submitted to Journal of Physical Oceanography.
2. Nikurashin, M. and Ferrari, R. Radiation and dissipation of internal waves generated by geostrophic motions impinging on small-scale topography: Theory. Journal of Physical Oceanography, 40, 1055-1074 (2010)